

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
21 February 2002 (21.02.2002)

PCT

(10) International Publication Number
WO 02/14196 A1

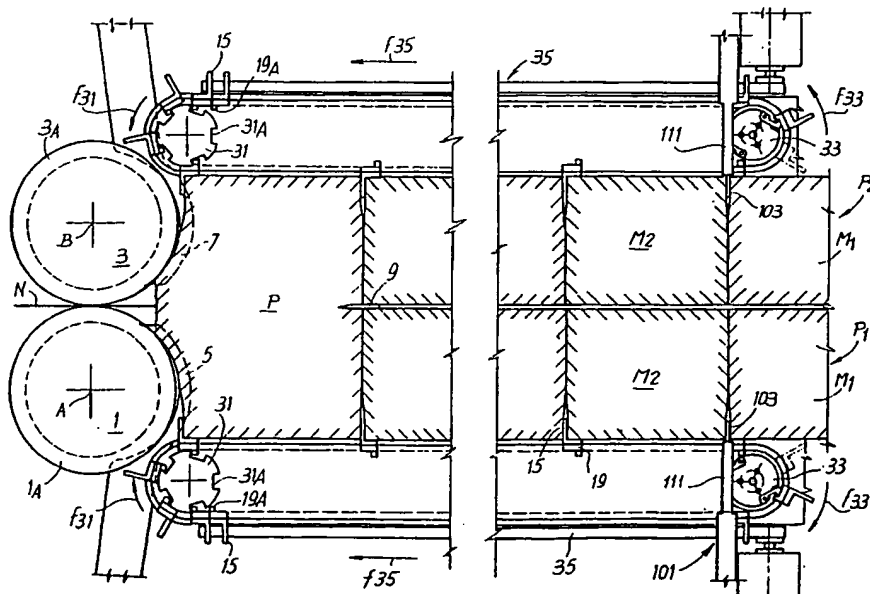
- (51) International Patent Classification⁷: **B65H 33/02**, 33/18, 45/20 (74) Agents: **MANNUCCI, Michele et al.**; Via della Scala, 4, I-50123 Firenze (IT).
- (21) International Application Number: PCT/IT01/00439 (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (22) International Filing Date: 7 August 2001 (07.08.2001)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: FI2000A000182 14 August 2000 (14.08.2000) IT (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- (71) Applicant (*for all designated States except US*): **FABIO PERINI S.P.A.** [IT/IT]; Via per Mugnano, I-55100 Lucca (IT).
- (72) Inventors; and
- (75) Inventors/Applicants (*for US only*): **BETTI, Giulio** [IT/IT]; Via di Piaggia, 8, Vorno, I-55060 Capannori, Lucca (IT). **BENVENUTI, Angelo** [IT/IT]; Via del Chiasso, 327, I-55100 Lucca (IT). **MORELLI, Alessandro** [IT/IT]; Via del Brennero 1896, I-55017 S. Pietro a Vico (IT).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

[Continued on next page]

(54) Title: DEVICE AND METHOD FOR SEPARATING PACKS OF LAMINAR PRODUCTS FROM ONE ANOTHER



(57) Abstract: The device comprises a guide (23) defining a closed for a plurality of separator fingers (15). In the vicinity of the end of the advance stretch of the guide is set a separating member (101) provided with a movement of insertion and extraction (f103) with respect to the pile of products (P, P1, P2), synchronized with the movement of advance of the products along the path of advance, so as to insert itself between two contiguous packs of laminar products (M1, M2), between which is inserted a respective separator finger (15), and to withhold temporarily the pile of laminar products whilst said separator finger (15) is moved away from the path of advance. (fig. 1).

WO 02/14196 A1



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

- 1 -

Device and method for separating packs of laminar products from one another

Description

Technical Field

The present invention relates to a device for separating packs of laminar products from one another, for example packs of paper serviettes produced by a folding machine. The invention relates also to a corresponding method for separating packs of laminar products from one another, as well as a folding machine which incorporates said device and which implements said method.

10 Background Art

From WO-A-9728076 a device is known for dividing a pile of laminar products into packs and for separating said packs from one another, said device comprising a path of advance for the pile of laminar products and, along said path of advance, a pair of guides defining respective closed paths along which pairs of separator fingers are made to advance. Each guide has an advance stretch and a return stretch, where at least the advance stretch is substantially parallel to the path of advance of the pile of laminar products. In order to separate two adjacent packs of products from one another in the unloading area and thus to enable separate and individual unloading of each pack, while holding back the subsequent pack, this known device envisages a system which, in the unloading area, causes temporary divarication of the two fingers making up each pair. In this way, the most advanced pack in the pile is moved away from the next, and is then unloaded. This known device is particularly effective, simple to build and reliable, especially as compared to the devices known previously. However, the pairs of fingers and the mechanism that causes their divarication in the area for unloading the packs of serviettes may, under certain working conditions, require relatively frequent maintenance interventions to eliminate the dust that may lead to jamming.

Objects and Summary of the Invention

30 The object of the present invention is to provide a device that is even simpler and more reliable than prior devices.

The above and further objects and advantages, which will emerge

- 2 -

clearly for persons skilled in the art from the ensuing text, are basically achieved by means of a device in which it is envisaged that, in the vicinity of the end of the advance stretch of the guide where the separator fingers (which are, in this case, single, and not double) slide, there is set a separating member provided with a movement of insertion and extraction with respect to the pile of products that is moving forward along the path of advance. The movement of the separating member is synchronized with the movement of advance of the products along the path of advance, so that the separating member is inserted between two contiguous packs of laminar products, between which a respective separator finger is inserted. In this way, the separating member withholds the pile of laminar products temporarily, whilst the separator finger is moved away from the path of advance and the first pack in the pile can be unloaded. At the same time, a retention member for holding back the front face of the next pack is introduced.

Basically, thanks to the present invention, a method can be implemented for separating adjacent packs of laminar products, which comprises the steps of:

- temporarily inserting, between one pack and the next, between which a separator finger is set, a separating member;
- causing a divarication between said pack and the next pack, moving away said separator finger and temporarily withholding the next pack by means of the separating member;
- introducing a front-retention member, for example a moving blade, in front of the next pack; and
- sliding out the separating member.

The device that is thus obtained is simpler, and consequently more reliable, than the previously known devices, in so far as a single separating member (or else, two symmetrical separating members set on either side of the path of advance) in a fixed position with respect to the direction of advance of the products performs, in combination with the individual separator finger, the function previously performed by pairs of fingers. In this way, the number of components of the device is reduced, and reciprocally moving

- 3 -

parts, which might get jammed on account, for instance, of the large amount of dust frequently present in plants for producing this type of paper articles, are eliminated.

Further advantageous characteristics and embodiments of the device and method according to the invention are described in what follows and are defined in the attached claims.

Brief Description of the Drawings

A better understanding of the invention will be obtained by following the description and the attached drawings illustrating a possible, non-limiting, embodiment of the invention. More in particular, in drawings:

Fig. 1 is a plan view of a folding machine comprising a device according to the invention;

Fig. 2 is an enlarged plan view of the separator member, according to the plane indicated by II-II in Fig. 3;

Fig. 3 is a section according to the plane indicated by III-III in Fig. 2;

Figs. 4A-4D are plan views of the area for unloading the folded products in four distinct steps of the unloading operation;

Fig. 5 is a front view of the retention blade for holding back the packs of products;

Fig. 6 is a view according to the plane indicated by VI-VI in Fig. 5;

Fig. 7 is a plan view of the moving-surface system for turning over the packs of products;

Fig. 8 is a section according to the plane indicated by VIII-VIII in Fig. 7;

Figs. 9A-9C show a modified embodiment of the separator fingers and their operation;

Figs. 10A and 10B show sections respectively according to the plane indicated by X-X in Fig. 9B and in Fig. 9C; and

Figs. 11 and 12 show a further embodiment, Fig. 12 being a section according to the plane indicated by XII-XII in Fig. 11.

Detailed Description of the Preferred Embodiment of the Invention

In the attached drawings, and with reference first in particular to Fig. 1, the reference numbers 1 and 3 designate two folding rollers of a folding

machine for forming a pile P of serviettes or other folded laminar products. The folding rollers 1 and 3, which rotate about two vertical axes A and B, have annular grooves 1A and 3A within which arched arms 5 and 7 are housed, which detach the folded material from the respective roller and push it against
5 the pile P of products already formed as they come out of the machine. A continuous weblike material N, possibly folded along a longitudinal line, is fed into the nip defined between the two rollers 1 and 3, associated to which are systems of a type in itself known, which fold the material coming out of the nip once about the roller 1 and once about the roller 3 to produce a pile of
10 material folded in a zigzag fashion. At each fold, the respective arched arm 5 or 7 detaches the material from the roller and pushes it towards the pile P already formed.

Operation of the folding machine briefly described above is in itself known and will hence not be illustrated in greater detail herein.

15 The pile P of folded weblike material is pushed against a transverse blade 9, which cuts the pile into two parts P1 and P2, each made up of a plurality of serviettes folded into two or into four. Set downstream of the blade 9 is a partition wall, which keeps the two parts P1 and P2 into which the pile has been cut separate from one another, so enabling independent
20 manipulation of the two parts.

The pile P, P1, P2 advances along a path of advance defined by a feed channel delimited by a pair of side walls 11 (see also Figs. 5, 7 and 8) and by a bottom wall 12, at the end of which packs of serviettes M1, M2, ..., Mn, each containing a pre-determined number of products, are unloaded.

25 To separate one pack of serviettes M1 from the next pack M2, at the sides of the feed channel for the pile P, P1, P2, two series of separator fingers 15 are set, one on each side of the channel. Each separator finger 15 is integral with a respective slider 19, which slides in a respective slide guide. The arrangement can be seen in particular in Figs. 2 and 3. Set on each side
30 of the feed channel for the pile P, P1, P2 is a corresponding slide guide 23, within which the sliders 19 of the separator fingers 15 slide, said slide guide being closed at the top by a plate 25 made of a material having a low

- 5 -

coefficient of friction in order to enable easy sliding of the sliders 19. Each slide guide 23 has two rectilinear stretches which are radiused, in the vicinity of the folding rollers and in the vicinity of the area for unloading the packs of folded products, by arched end portions.

5 The slide guide 23 houses, inside it and along the internal rectilinear stretch, i.e., the one closest to the feed channel for the pile of serviettes, a drive belt 24 with a U-shaped cross section which defines a seat of engagement for bottom teeth 19X provided on the sliders 19. The belt has a speed of advance that can be adjusted and is approximately equal to the
10 speed of advance of the pile P of products in order to control movement of advance of the fingers 15 and of the sliders 19.

 Alternatively, the belt 24 may not be present, and the sliders 19 can engage directly in a fixed slide channel having a low coefficient of friction, which forms the slide guide 23. In this case, advance of the sliders is obtained
15 by means of the thrust exerted by the pile of folded products.

 Each slider is moreover provided with a rear appendage 19A for the purposes that will be described hereinafter.

 The guides 23 define a closed path, and in each one of the guides 23 there is preferably set an equal number of sliders 19, so that on each side of
20 the feed channel there corresponds, to each slider 19 and to the associated finger 15 in the guide 23, a slider 19 and an associated finger 15 in the guide 23 on the opposite side of the feed channel for the folded products.

 In an area corresponding to the two arched end areas of each guide 23 there are present a respective first grooved spool 31 (in the vicinity of the
25 respective folding roller 1, 3) with a series of longitudinal grooves 31A, and a second spool 33 (in the unloading area).

 Two hooks 33A are hinged to each spool 33 (see, in particular, Fig. 2) about axes parallel to the axis of rotation of the spool 33, said hooks being elastically loaded by springs 33C so that they will protrude from the periphery
30 of the spool 33. The hooks 33A engage each slider 19 by means of the appendages 19A of the latter, which are provided on the rear part (i.e., the part opposite to the separator fingers 15) of each slider 19.

- 6 -

With the above arrangement, the stepwise rotation in a clockwise direction, indicated by the arrow f31, of the first grooved spool 31 causes hooking of the rear appendages 19A of the sliders 19 by the grooves 31A, and hence transfer of the sliders 19 from the respective external rectilinear stretch of the guide 23 to the internal rectilinear stretch, i.e., the stretch facing the pile P of products. Stepwise rotation of the grooved spool 31 can be obtained using any suitable system, for instance, using a free-wheel mechanism operated by a linear cylinder-piston actuator, or else using a rotary actuator. Likewise, stepwise rotation of the second spool 33 in the direction indicated by the arrow f33 causes hooking and transfer of the sliders 19 and of the fingers 15 that are integral with them from the internal rectilinear stretch to the external rectilinear stretch of the respective guide 23.

On each side of the feed channel for the pile P, P1, P2 of products and parallel to the external rectilinear stretch of each guide 23 a continuous flexible member 35 develops, which is run over two pulleys and which is provided with bristles that engage the fingers 15 transferred by the second spool 33 onto the external rectilinear stretch of the respective guide 23 and draw them along in the direction indicated by the arrow f35, in a direction opposite to the direction of advance of the pile P, P1, P2 of products. The sliders 19 are carried by the flexible member 35 until they come into contact with the first spool 31, as may be seen in Fig. 1. A number of fingers 15 are piled up against the spool 31, whilst the flexible member 35 can slide beneath them by deformation of the bristles with which this member is equipped. At each rotation of the first spool 31 the fingers piled against it are pushed by the member 35 so that they remain in contact with the spool itself. The number of fingers 15 waiting, which are set up against the spool 31, depends upon the size of the packs of products M1-Mn being formed: the larger the size of each individual pack, the greater the number of pairs of fingers 15 waiting.

In the vicinity of the end area (i.e., the one furthest away from the folding rollers 1, 3) of each guide 23 there is set a separating member generically designated by 101, which does not translate in the direction of advance of the pile of products and which is provided with a transverse

- 7 -

movement of insertion and extraction with respect to the pile itself. This movement, as will emerge clearly from what follows, is synchronized with the movement of the separator fingers 15 to enable temporary withholding, separation and unloading of each pack of products.

5 Each separating member 101 (see in particular Figs. 2 and 3) comprises a stem 103 integral with the rod 105 of a cylinder-piston actuator 107, which governs the reciprocating movement indicated by the double-headed arrow f103 of the stem 103 itself. In its own movement, the stem 103 is guided in a groove 109 made in a supporting element 111 that is fixed with
10 respect to the guide 23, integral with an appendage 113 of which is the cylinder-piston actuator 107.

The operation of the device so far described is as follows.

The folding rollers 1 and 3 rotate continuously to form the pile P, which is then cut by the blade 9 into the two parts P1, P2. In this step, in a position
15 adjacent to each roller 1 and 3 there is waiting a respective separator finger 15, which remains stationary outside the folding area. When a pre-set number of folds has been reached, which will give rise to a pre-set number of serviettes as a result of the cutting operation performed by the blade 9, on each side of the machine the respective grooved spool 31 rotates by one
20 step, so bringing the slider 19, and consequently the respective separator finger 15, from the extracted position external to the folding rollers in the folding area, into a position that is more advanced with respect to the point in which the subsequent fold of the weblike material N is formed. This movement is made possible by the presence of annular grooves in the folding rollers 1
25 and 3. The sliders 19 are totally released from the grooved spool 31 and are inserted with their bottom appendages 19X into the respective longitudinal seats of the belts 24 set in the guides 23, along the stretch of path facing the feed channel.

As feeding of the weblike material N continues, and hence folding
30 thereof with accumulation of material folded into the pile P, the two fingers 15 on the two sides of the feed channel, drawn along by the respective grooved spools 31 into the active area of folding, remain engaged between one fold

- 8 -

and the next, and start to advance along the guides 23, being pushed by the pile P, P1, P2 itself of products that are advancing as a result of the action of the arms 7, aided therein by the action of the respective drive belts 24, the speed of advance of which (as has been said previously) is approximately
5 equal to the speed of advance of the pile P.

When the two sliders 19 on the two sides of the feed channel of the pile P, P1, P2 reach the end of the rectilinear stretch of the guides 23, the first group of laminar products or serviettes M1 is separated from the next group M2 by means of the pair of separator fingers 15 and by the separating
10 members 101 in the way illustrated in Figs. 4A-4D, where one side of the feed channel for the pile of serviettes is shown, it being understood that on the opposite side a symmetrical arrangement of members carries out a symmetrical succession of movements. In Fig. 4A, a separator finger 15 is set between two packs M1 and M2 of products and advances together with these
15 in the direction indicated by the arrow F. The stem 103 is in the extracted position, i.e., retracted underneath the support 111.

In Fig. 4B the separator finger 15 set between the packs M1 and M2 is aligned with the stem 103 of the separating member 101, which has been timely extracted by the cylinder-piston actuator 107 to be inserted into the gap
20 between the two successive packs M1 and M2, which are slightly divaricated thanks to the presence of the separator finger 15. As may be seen in Fig. 4C, the spool 33 is now rotated by a first angle so as to hook, by means of one of its hooks 33A, onto the rear appendage 19A of the slider 19, with which the finger 15 set between the packs M1 and M2 is integral, and to move the slider
25 19 itself away through an angle from the position in which the stem 103 is situated. During this step, the hook 33A is made to go back in, overcoming the force of the spring 33C in such a way that the slider 19 and the finger 15 can approach the axis of rotation of the spool 33 so as to be released more easily from the pack of serviettes. The thrust is obtained by means of an inclined
30 radiusing profile 26, which acts on the slider 19.

The second hook 33A carried by the spool 33 undergoes a similar rotation, and in this way brings a slider 19, previously removed from the area

of unloading of the serviettes, up to the external rectilinear branch of the guide 23, along which it is drawn until it reaches the grooved spool 31 again, so that it can be re-used. Return of the sliders 19 along the external rectilinear branch of the guide 23 is obtained by means of a flexible member 35 in a way in itself
5 known.

Fig. 4D shows a further step (which can partially overlap the previous step) in which the stem 103 has been retracted after a blade 81 or other suitable front-retention member of the pile has been inserted in the path of advance of the pile of serviettes. The mechanism for insertion of the blade 81
10 is illustrated in Fig. 5 and will be described in greater detail in what follows. In this way, the front of the pile of serviettes is withheld by the blade 81, which, as will be described hereinafter, advances along the path of advance of the serviettes, and the stem 103 can move back, so releasing the pile of serviettes. The blade 81 advances until it accompanies the front of the pile of
15 products against a vertical contrast surface which also has the function of containing the products and forms part of the means for turning over and unloading the individual packs of products by oscillating about a horizontal axis orthogonal to the direction of advance of the pile of products. The purpose of the oscillating movement is to unload the individual pack of
20 products onto an underlying conveyor, as described in what follows.

The means for turning over and unloading the individual packs M1, M2, ..., Mn of products separated by means of the separator fingers and the stems 103 are illustrated in particular in Figs. 5-8, and are basically equivalent to the ones described in detail in WO-A-9728076, the content of which is
25 incorporated in the present description.

The wall 12 defining the bottom of the feed channel for the pile P, P1, P2 ends with a comb-like portion 12A, which co-operates with a moving surface 41 defined by a plurality of laminae 41A carried by a bracket 43 articulated in 45 to a block 47. Each lamina 41A has a slot 41B within which
30 there engages, in an adjustable position, a bar 49 which is orthogonal to the surface 41. The bars 49 are aligned together to define the aforesaid vertical contrast surface, which also has the function of containing the pile of

products.

The surface 41 formed by the laminas 41A can be turned over about the horizontal axis 45 by means of a cylinder-piston actuator 51. In addition, the block 47, with the plate 53, the actuator 51, and the surface 41, can
5 translate according to the double-headed arrow f47 by means of a mechanism illustrated in Fig. 7 (in itself known and not described in greater detail herein), which comprises an actuator 61.

Set above the surface 41 is the blade 81, operated, for example, by means of a mechanism illustrated in isolation, in particular in Figs. 5 and 6.
10 The blade 81 is constrained to a spindle 83 which develops parallel to the direction of advance F of the pile P, P1, P2 of products in such a way as to oscillate integrally with the spindle itself about the axis of the latter. The spindle 83 is constrained by means of an arm 85 to a cylinder-piston system 87 which controls oscillation of the spindle about its own axis in order to
15 cause, in this way, oscillation of the blade 81 between a top position, which is extracted with respect to the pile P, P1, P2 (indicated by the solid line in Fig. 5) and a bottom position (indicated by a dashed line in Fig. 5), in which the pile of products rests on the blade itself.

The support 81A of the blade (Fig. 6) is in addition constrained to the
20 stem 88 of a further cylinder-piston actuator 89, which displaces the blade 81 in a direction parallel to the direction of advance F of the pile P.

The arrangement now described is symmetrical, there being provided a pair of blades 81 set alongside one another, one in a position corresponding to each portion P1, P2 of the pile of products coming from the machine.

25 The operations of unloading packs of products take place as described below.

The bars 49 are brought initially into the position where they are closest to the folding rollers 1 and 3, and the most advanced products in the pile P, P1, P2 rest on the bars 49 and are pushed against them. As the weblike
30 material N is folded and the serviettes are formed by the rollers 1, 3 and by the blade 9, the bars 49 translate under the control of the motor 61 to provide room for the new products coming from the machine.

- 11 -

A sensor (not shown) emits a signal when a pair of fingers 15 reaches the position of Fig. 4A. This signal represents enabling for start of the cycle for unloading of the pack M1 of serviettes, which takes place as described in what follows. The stems 103 are inserted in the gap between adjacent packs
5 separated by the fingers 15 in the most advanced position along the product-feed channel. The fingers 15 and the sliders 19 that are integral with them are moved away by rotation of the spools 33. The blade 81 is lowered and penetrates into the empty space thus created. The entire process corresponds to the one already described with reference to Figs. 4A-4D. The
10 surface 41 is rotated through 90° by the cylinder-piston actuator 51 in order to tip the pack M1 onto a conveyor 91 (Fig. 8) consisting of a plurality of parallel belts, between which the laminas 41A and the corresponding bars 49 pass.

The next pack M2 is withheld at the front by the stems 103 and then by the blade 81 after the latter has been inserted with a movement about the axis
15 of the stem 88.

Once the pack M1 has been deposited on the conveyor 91 and has been removed from the unloading area by means of the conveyor 91 itself, the surface 41 is raised up again by means of the cylinder-piston actuator 51, whilst the actuator 61 causes the ensemble 41, 43, 47, 49 to move back to a
20 position in which the bars 49 come into contact with the front surface of the pack M2. This position is determined by the PLC which controls the actuator 61 according to the values of thickness of the weblike material N and the rate of production, in so far as, in the meantime, the blade 81 is pushed forwards under the thrust of the pile of products to enable continuous operation of the
25 folding machine without substantial increase in the compression of the products. Before the surface 41 and the bars 49 return to the position in which they are resting against the advancing pile, the fingers 15 are extracted by the spools 33 (Fig. 4D), so that the pack M2 is withheld in the last step by just the blade 81, which is free to advance under the thrust of the pile P, extracting the
30 stem of the cylinder-piston system 89.

When the bars 49 are again in contact with the first serviette of the advancing pile, the blade 81 is slid out upwards by means of the actuator 87

- 12 -

and is then retracted into the initial position by means of the actuator 89.

As may be seen in the attached figures, the actuators and devices that enable unloading of the packs of products are double and symmetrical, in so far as the unloading of the packs M1 from the two portions P1 and P2 into
5 which the pile P has been cut cannot take place simultaneously.

In the embodiment so far described, the stem 103 of the separating member 101 describes a movement orthogonal to the direction of advance of the products and substantially parallel to the axis of the stem itself. In certain cases, it may be convenient for the stem 103 to be inserted between adjacent
10 packs of products in a position as close as possible to the position in which the separator finger is located. This is convenient, for example, when the products are made of very compliant material which tends to close immediately onto the separator fingers without leaving sufficient space for insertion of the stem 103.

15 In such a case, it may be envisaged that the separator fingers 15 and the sliders 19 have a guide groove within which the stem 103 slides during its movement of insertion between adjacent packs of products. Once the end of the stem 103 is inserted between the consecutive packs of products, the stem 103 can be raised to be released from the slider 19 and from the finger 15.

20 One way to obtain this movement may be that of appropriately shaping the finger 15, as illustrated in Figs. 9A-9C and 10A, 10B, where also the stem 103 is represented in different positions during the movement of insertion. Fig. 9A illustrates the slider 19 with the separator finger 15 integral with it, partially sectioned to show the guide groove 15X. The guide groove 15X ends with a
25 curved area for connection to a projecting toothlike end portion or toe 15Y. Figs. 9B and 9C illustrate how the stem 103 is guided along the groove 15X until it encounters with its end the curvature of radiusing. Continuation of the movement of advance of the stem causes it to climb up the end portion or toe 15Y and hence, in practice, causes raising of the stem 103, which is thus
30 released from the guide groove 15X, as shown in Fig. 9C. In this position, the separator finger 15 can be removed by the spool 33 in the way described above, whilst the stem 103 remains up against the second pack of folded

- 13 -

products. Figs. 10A and 10B show the cross section according to the plane indicated by X-X of Figs. 9B and 9C, respectively.

The movement of raising of the stem 103 can be obtained by bending of the stem itself, or else also by the stem being mounted, together with the
5 corresponding actuator 107, so that it can oscillate in a vertical plane.

The possibility is not ruled out of the movement of raising the stem 103 with its consequent release from the guide groove 15X taking place in a different way, for example by means of a further actuator, or else by means of a cam profile which is outside the area of the finger 15 and the slider 19.

10 The return path of the separator fingers can develop on different levels so as to prevent collision of the fingers with the stem 103 in the return step. Alternatively, the stem 103 can be appropriately shaped with a double Z-like curvature, with the distal area at a lower level corresponding to the level of the separator fingers 15 to be inserted between the adjacent packs of products,
15 whilst the proximal area with respect to the actuator 107 is at a higher level so as not to interfere with passage of the fingers 15 in the return path.

When a lifting movement of the stem 103 is not required, its insertion in the gap between adjacent packs of products in a position corresponding to the overall dimensions of the separator finger 15 can be obtained also with a
20 different shaping of the finger itself, as illustrated in Figs. 11 and 12. In this case, the top surface of the separator finger 15 is shaped in steplike fashion. The step again forms a groove 15X for guiding the stem, even though it is open on one side. The stem 103 is inserted in the lowered area of the separator finger. The separator finger 15 can move away after insertion of the
25 stem 103 without the latter moving vertically thanks to the steplike shape of the finger itself, the movement of advance of which is indicated by the arrow in Fig. 12. Fig. 11 also shows a possible Z-like shaping of the stem 103.

It is understood that the drawings only provides an illustrative example furnished purely by way of practical demonstration of the invention, given that
30 the invention may vary in its embodiments and arrangements without thereby departing from the scope of the idea that underlies the invention itself. The possible presence of reference numbers in the attached claims has the

- 14 -

purpose of facilitating reading thereof with reference to the description and to the drawings, and in no way limits the scope of protection represented by the claims.

- 15 -

CLAIMS

1. A device for dividing a pile of laminar products into packs and for separating said packs (M1-Mn) from one another, comprising a path of advance of said pile of laminar products and, along said path of advance, at least one guide (23) defining a closed path for a plurality of separator fingers (15), with an advance stretch and a return stretch, at least the advance stretch being substantially parallel to the path of advance of said pile of laminar products,
characterized in that set in the vicinity of the end of the advance stretch of said guide is a separating member (101) provided with a movement of insertion and extraction (f103) with respect to said pile of products (P, P1, P2), said movement being synchronized with the movement of advance of the products along the path of advance, in such a way that said separating member (101) inserts itself between two contiguous packs of laminar products (M1, M2), between which a respective separator finger (15) is inserted, and temporarily withholds the pile of laminar products while said separator finger (15) is moved away from the path of advance.
2. The device according to Claim 1, characterized in that said separating member is provided with a movement substantially orthogonal to the movement of advance of the pile of laminar products along said path, whilst it is fixed in the direction of advance of the pile of products.
3. The device according to Claim 1 or 2, characterized in that said separating member has a stem (103) that inserts between two contiguous packs of laminar products in a position corresponding to the separator finger (15) set between said two packs.
4. The device according to one or more of Claims 1 to 3, characterized in that said separating member co-operates with a front-retention member (81) which is mobile in a direction parallel to the direction of advance of the products along said path of advance, said front-retention member being insertable in and extractable from said path of advance, the separator member being inserted between adjacent packs of laminar products for creating the gap suitable for insertion of said front-retention member (81)

- 16 -

and being removed from the path of advance after said front-retention member has been inserted in said path of advance.

5 5. The device according to at least Claim 3, characterized in that each of said separator fingers has a guide groove (15X) for guiding said stem (103).

6. The device according to Claim 5, characterized in that said stem is provided with a raising movement for being released from said guide groove.

10 7. The device according to Claim 6, characterized in that said guide groove is shaped in such a way as to impart said raising movement on the stem (103) in the end part of the travel of insertion of the stem (103) between contiguous packs of products.

15 8. The device according to Claim 5, characterized in that said separator fingers have a steplike groove to enable extraction of the finger when the separating member has penetrated between adjacent packs of products in a position corresponding to said steplike groove.

20 9. The device according to one or more of the foregoing claims, characterized in that it comprises a guide (23) on each side of said path of advance, in each of said guides there being mobile a plurality of separator fingers (15), and to each guide there being associated a respective separating member (101).

25 10. A folding machine comprising a pair of folding rollers (1, 3), between which a strip of weblike material (N) is folded in zigzag fashion, and a blade (9) which divides the zigzag-folded material into two portions, characterized in that it comprises a separating device according to one or more of the foregoing claims.

11. A method for separating adjacent packs of laminar products from one another, comprising the steps of:

- 30 -
- inserting at least one separator finger between one pack and the next;
 - advancing said separator finger along a path of advance of the laminar products; and
 - moving away one pack of products from the next pack, and unloading the said pack;

- 17 -

characterized in that at least one separating member (103) is temporarily inserted between said pack and the next pack before said pack is separated from said next pack, and in that said pack is moved away from the next pack by removing the separator finger set between the two packs, the next pack
5 being temporarily withheld by said at least one separating member.

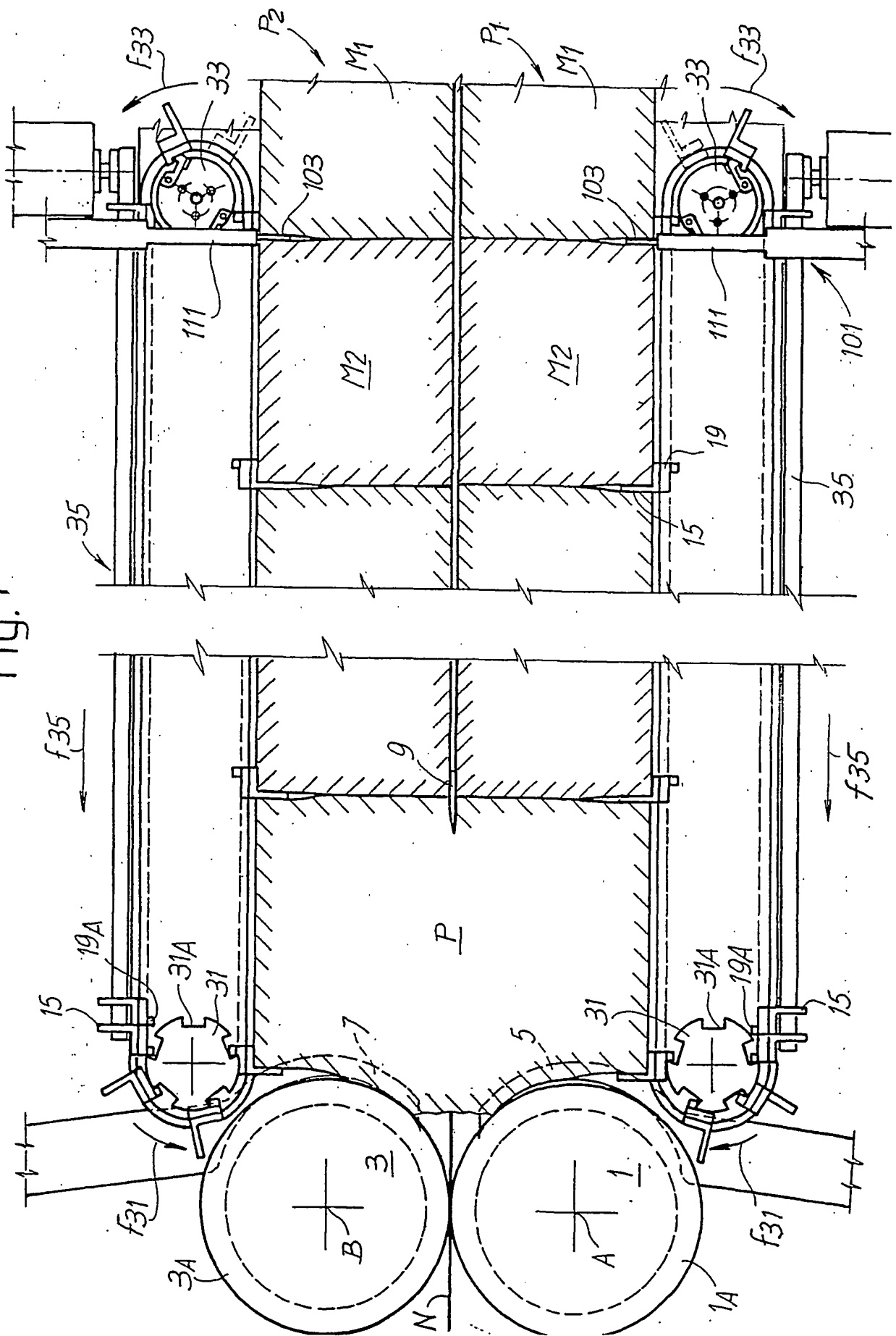
12. The method according to Claim 11, characterized by the steps of:

- temporarily inserting said separating member (103) between said pack and the next pack;
- causing a divarication between said pack and the next pack, moving away
10 said separator finger (15) and temporarily withholding the next pack by means of the separating member (103);
- introducing a front-retention member (81) in front of the next pack; and
- sliding out the separating member (103).

13. The method according to Claim 11 or 12, characterized in that said
15 separating member is guided in a groove of the corresponding separator finger.

14. The method according to Claim 13, characterized in that the separating member is raised at the end of its insertion between adjacent packs of products.

Fig.1



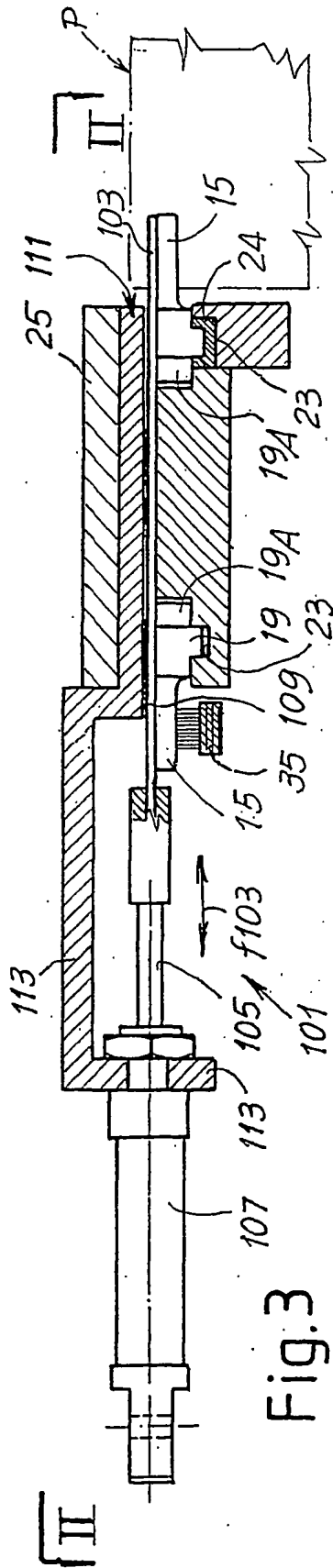


Fig. 3

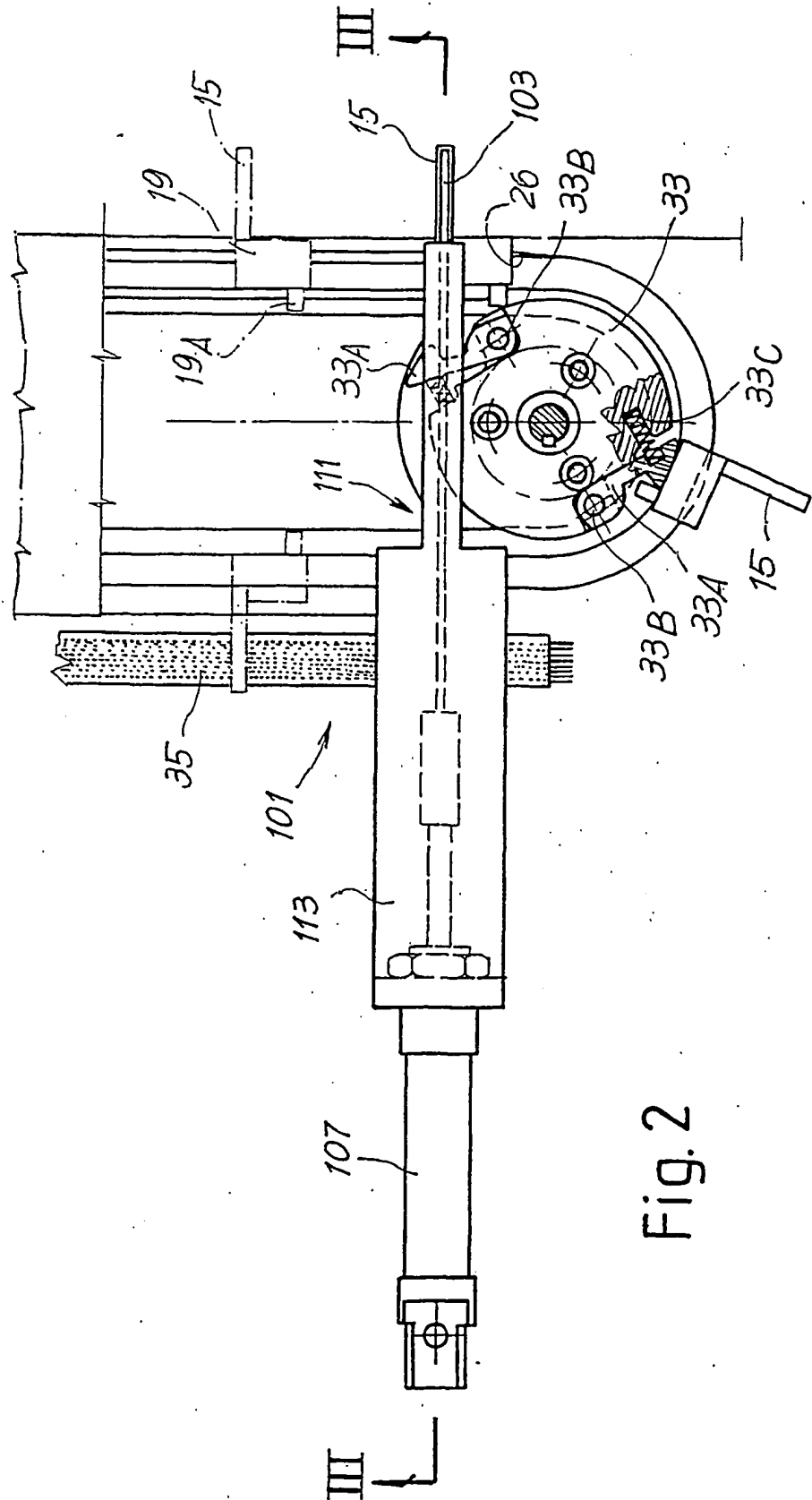
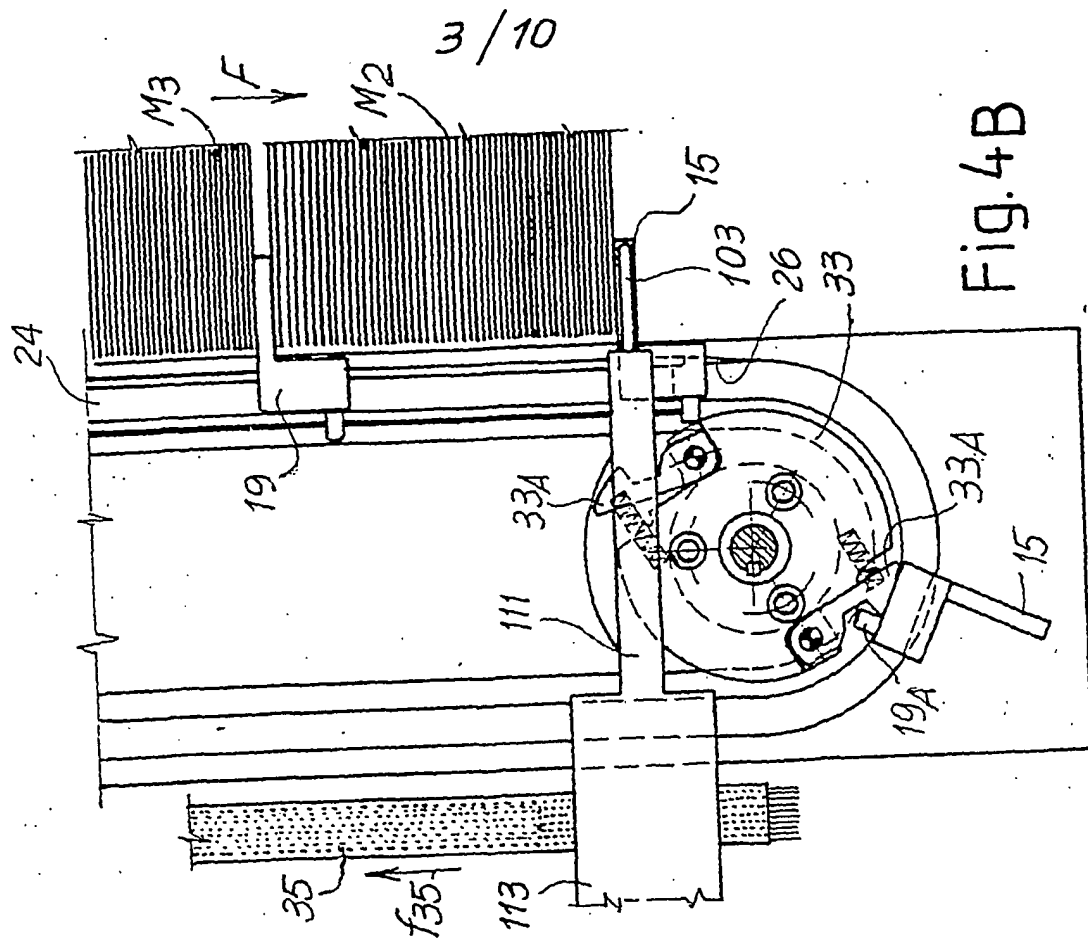
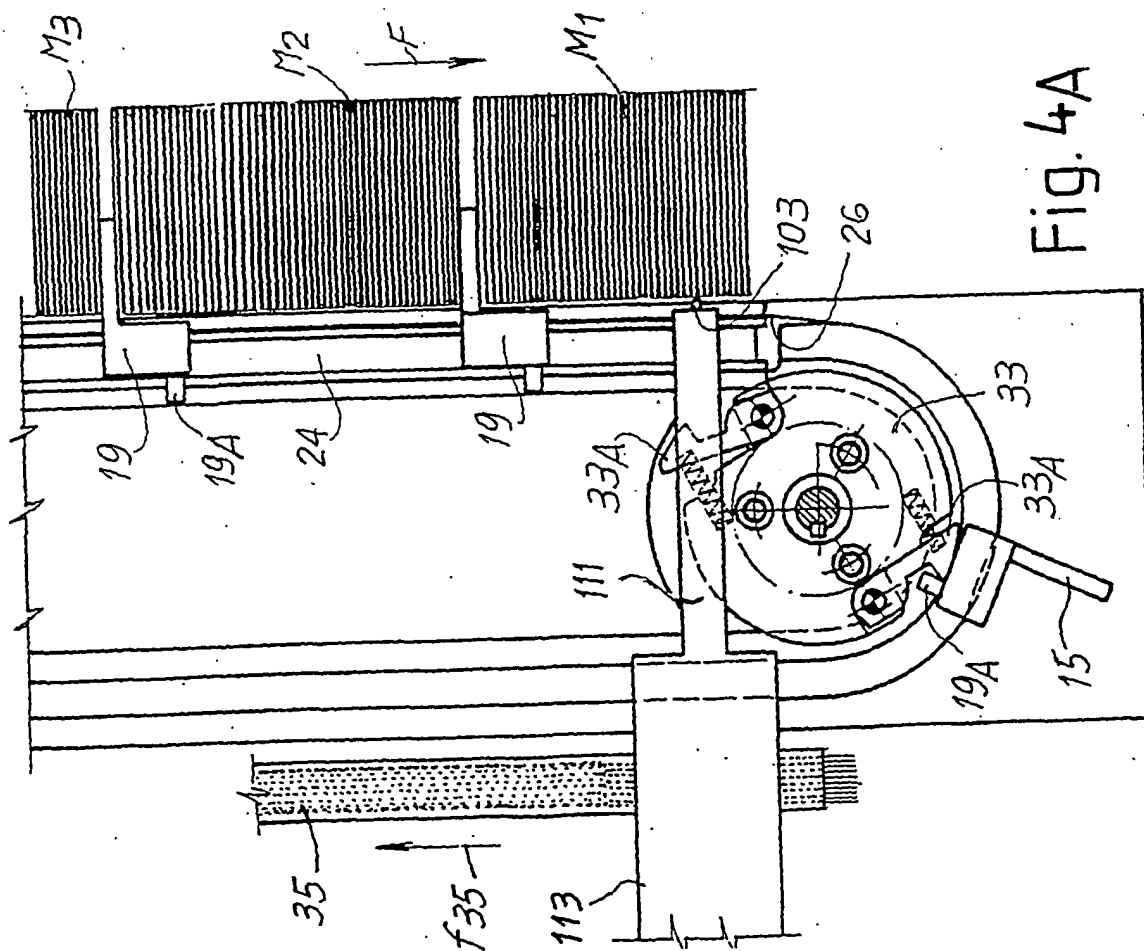
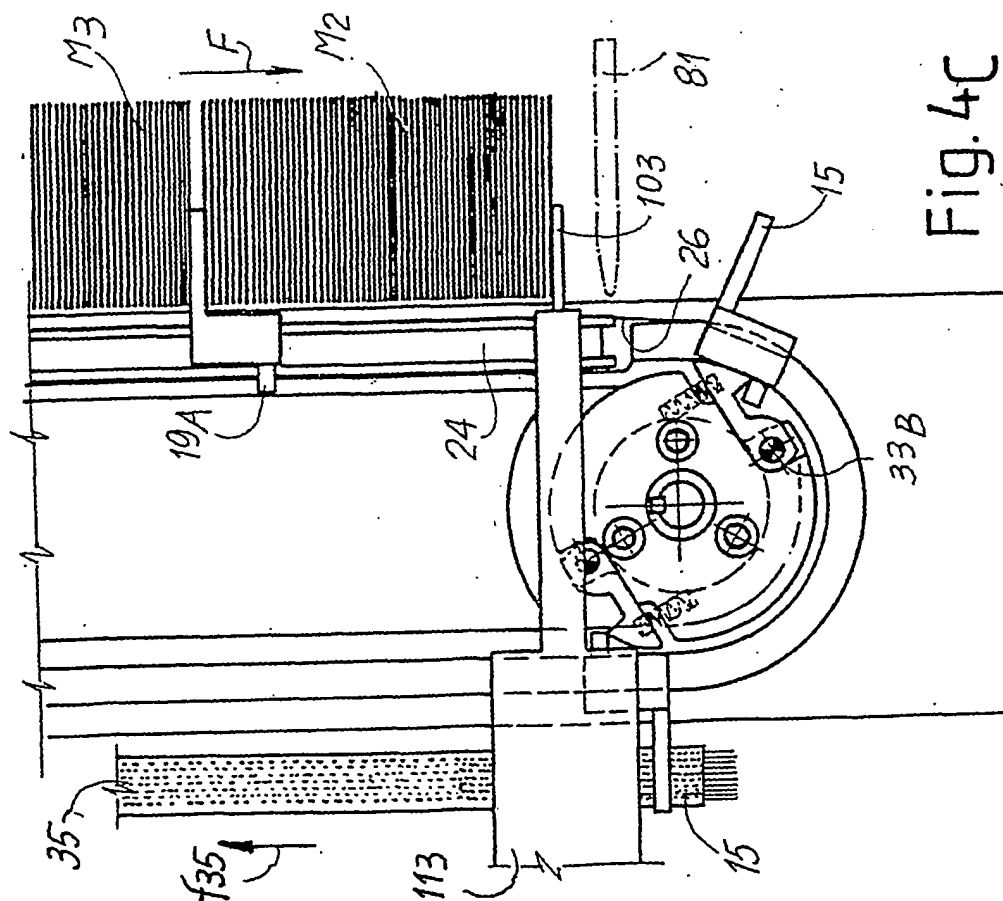
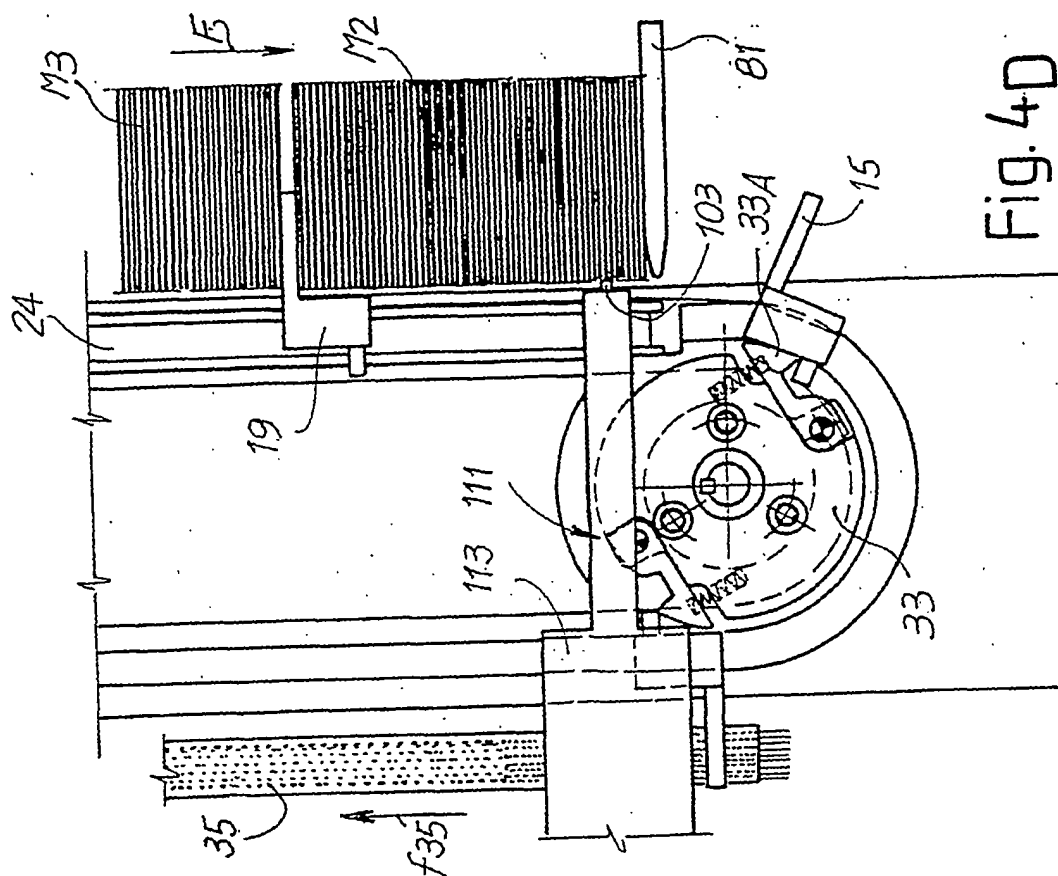


Fig. 2

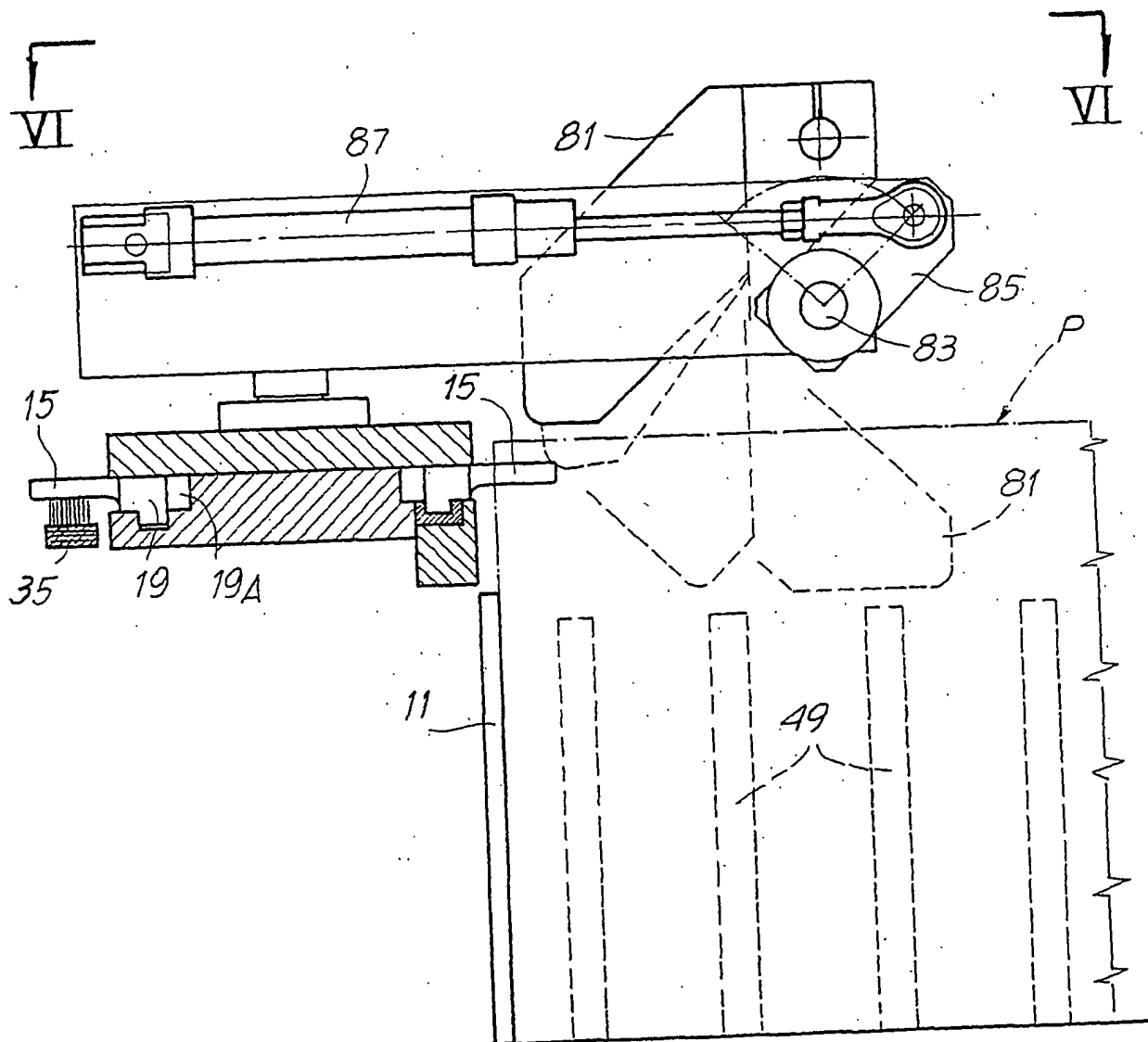


4 / 10



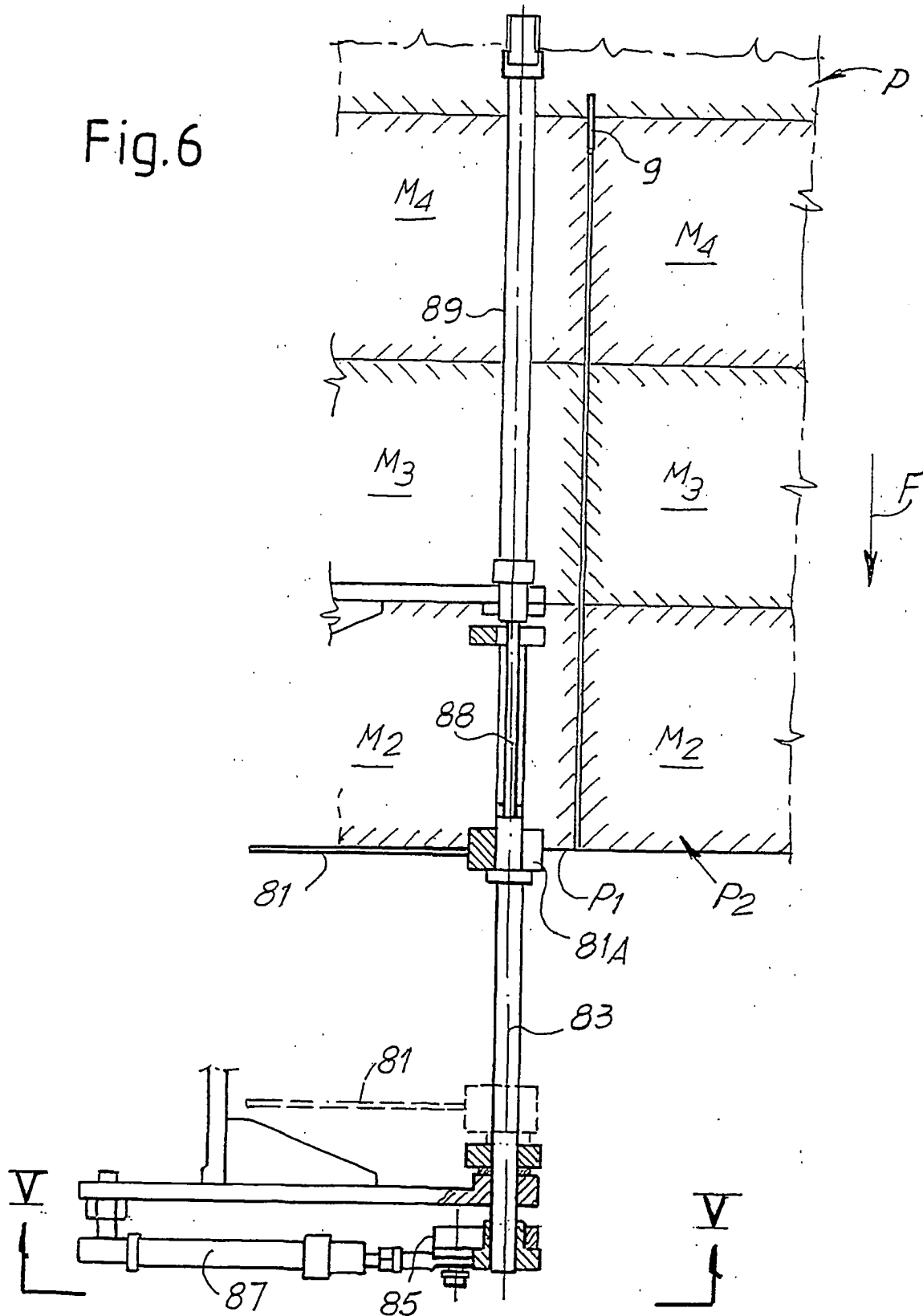
5 / 10

Fig. 5



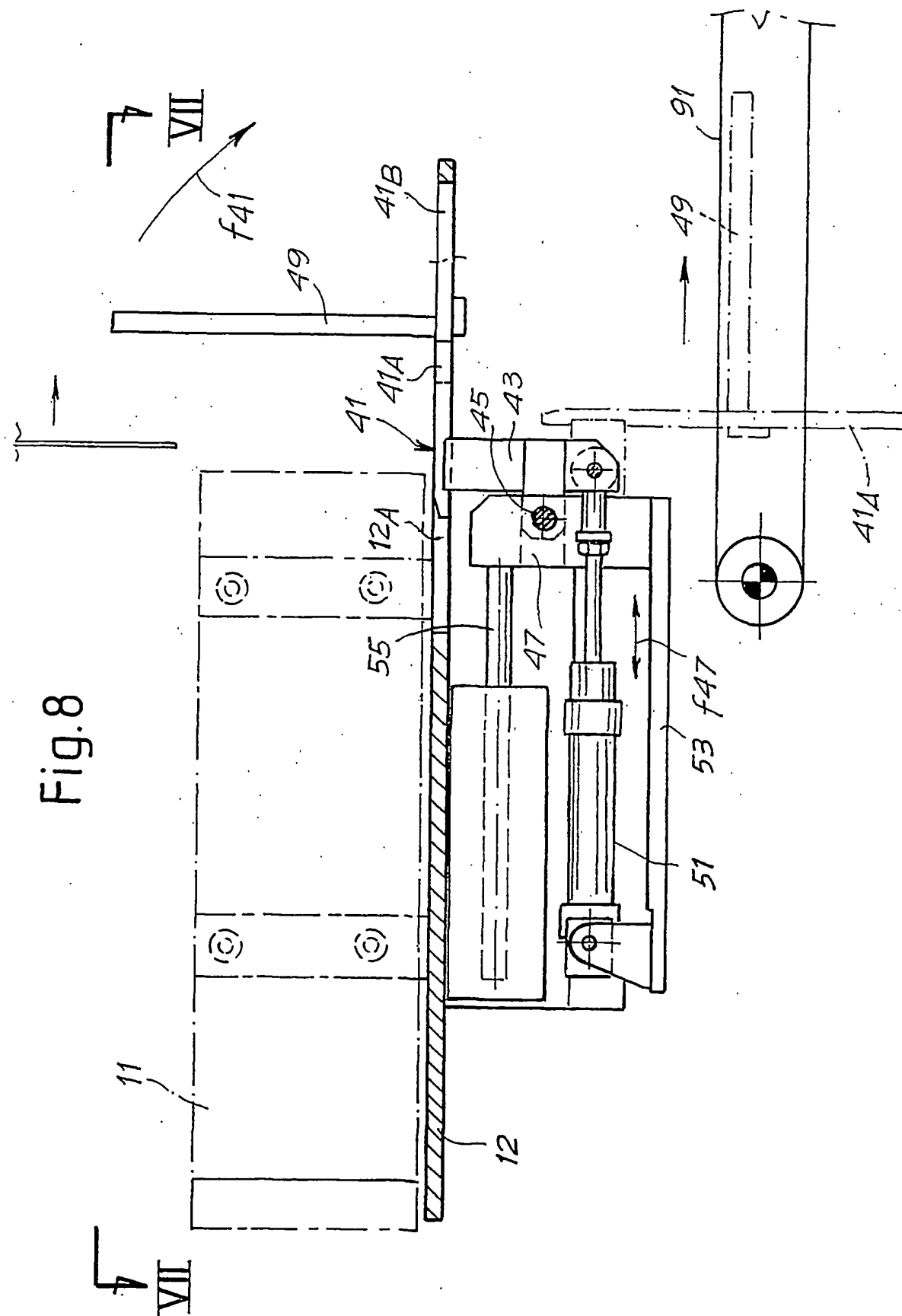
6/10

Fig.6



8/10

Fig. 8



9 / 10

Fig. 9A

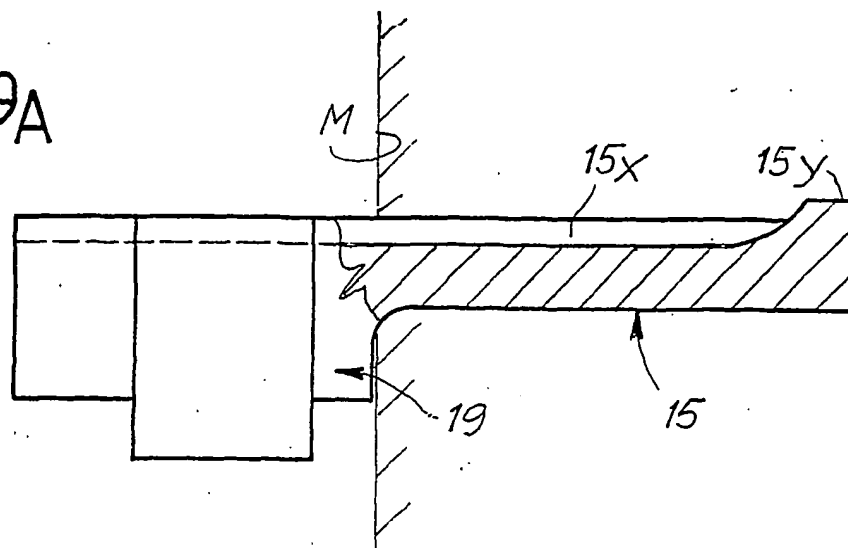


Fig. 9B

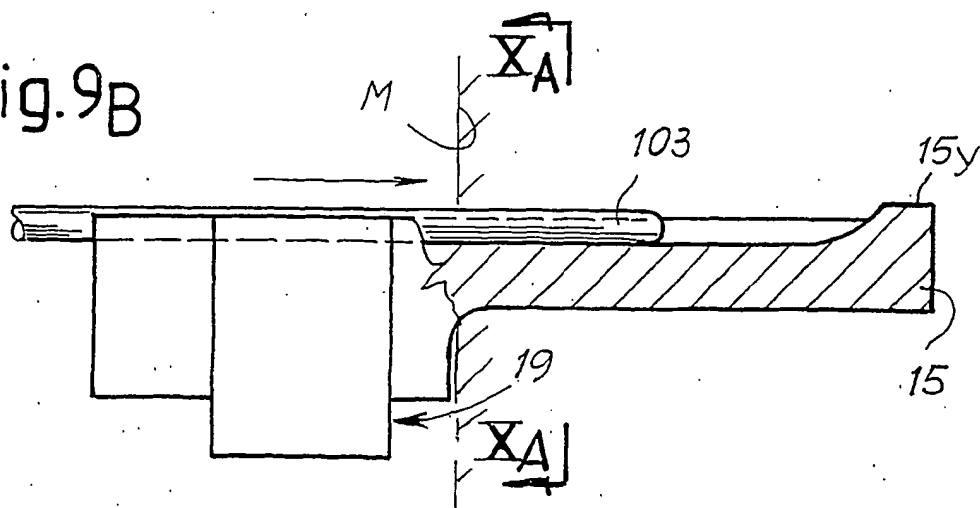
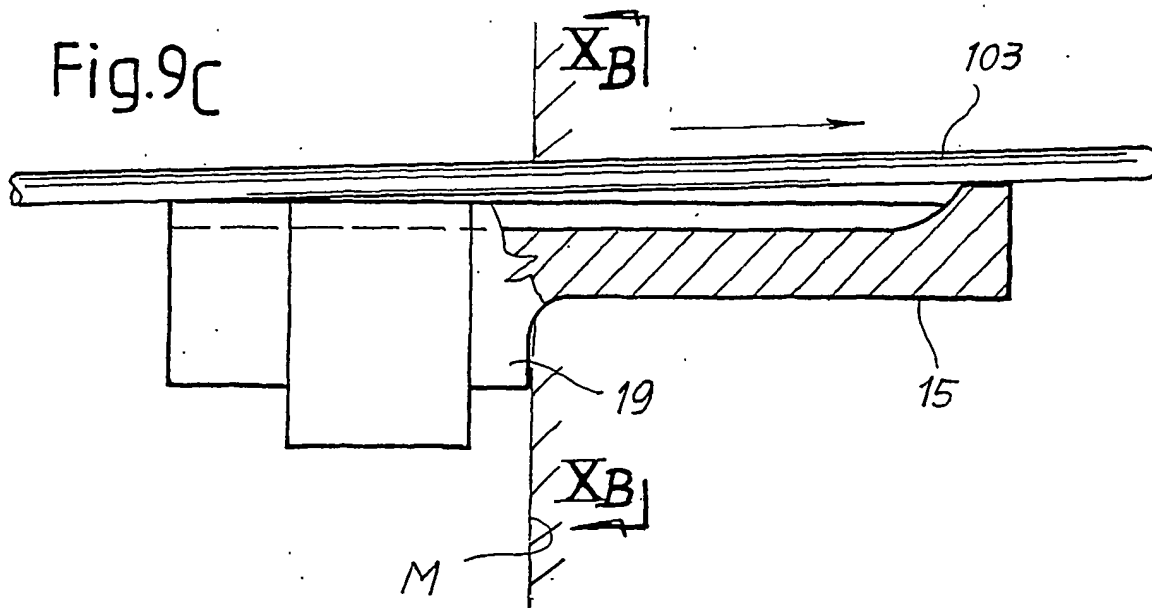


Fig. 9C



10/10

Fig. 10A

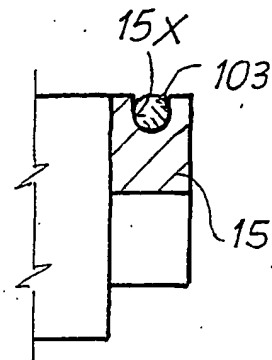


Fig. 10B

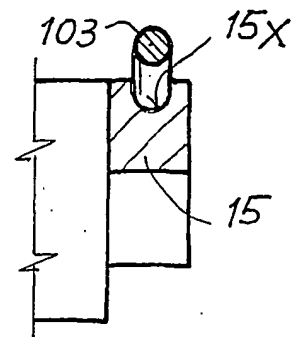


Fig. 11

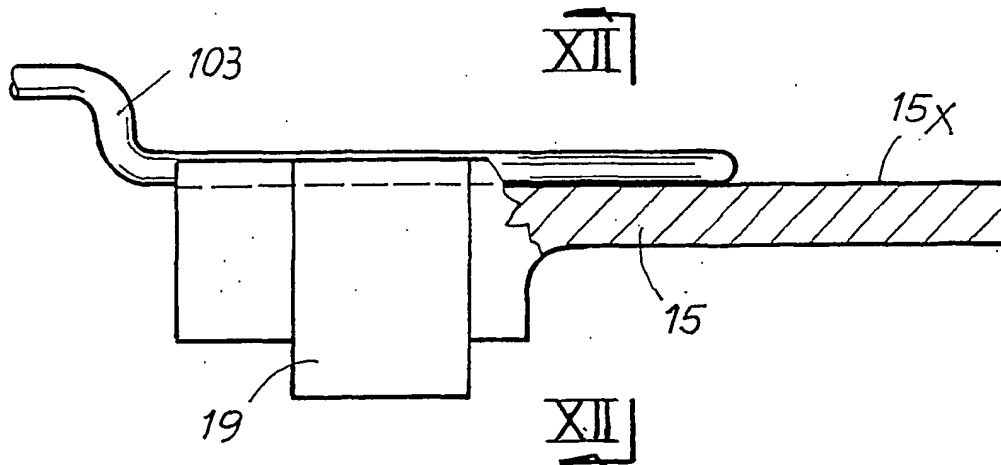
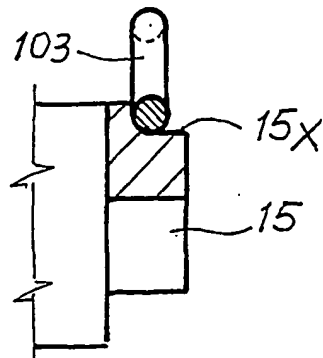


Fig. 12



A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B65H33/02 B65H33/18 B65H45/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B65H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 162 649 A (THORNTON JOHN N) 31 July 1979 (1979-07-31) column 5, line 44 -column 8, line 26; figures	1,2,4, 11,12
A	WO 97 28076 A (PERINI FABIO SPA ;GHILARDI MAURO (IT)) 7 August 1997 (1997-08-07) cited in the application page 8, line 3 -page 12, line 16; figures 1-9	1,10,11
A	GB 1 018 235 A (FERAG AG) 26 January 1966 (1966-01-26) page 2, right-hand column, line 85 -page 3, right-hand column, line 104; figures -/--	1,11

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

30 November 2001

Date of mailing of the international search report

07/12/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Thibaut, E

INTERNATIONAL SEARCH REPORT

In International Application No

PCT/IT 01/00439

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 240 691 A (GRAPHIA HOLDING AG) 14 October 1987 (1987-10-14) page 5, line 22 -page 6, line 17; figures -----	1,11

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4162649	A	31-07-1979	NONE	
WO 9728076	A	07-08-1997	IT FI960008 A1	30-07-1997
			AT 193270 T	15-06-2000
			AU 1617097 A	22-08-1997
			BR 9707478 A	06-04-1999
			CA 2244832 A1	07-08-1997
			CN 1210500 A , B	10-03-1999
			DE 69702118 D1	29-06-2000
			DE 69702118 T2	01-02-2001
			EP 0879200 A1	25-11-1998
			ES 2146078 T3	16-07-2000
			GR 3033540 T3	29-09-2000
			WO 9728076 A1	07-08-1997
			JP 2000503953 T	04-04-2000
			US 6120240 A	19-09-2000
GB 1018235	A	26-01-1966	NONE	
EP 0240691	A	14-10-1987	CH 670810 A5	14-07-1989
			AT 49181 T	15-01-1990
			DE 3761303 D1	08-02-1990
			EP 0240691 A1	14-10-1987